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PRE-APPEAL BRIEF REQUEST FOR REVIEW		Docket Number (Optional) M4065.0957/P957	
	Application Number 10/725,500-Conf. #3970	Filed December 3, 2003	
	First Named Inventor Joseph F. Brooks et al.		
	Art Unit 2818	Examiner Quoc D. Hoang	
<p>Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.</p> <p>This request is being filed with a notice of appeal.</p> <p>The review is requested for the reason(s) stated on the attached sheet(s). Note: No more than five (5) pages may be provided.</p> <p>I am the</p> <p><input type="checkbox"/> applicant /inventor.</p> <p><input type="checkbox"/> assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)</p> <p><input checked="" type="checkbox"/> attorney or agent of record. Registration number 28,371</p> <p><input type="checkbox"/> attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34. _____</p> <p>NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.</p> <p><input type="checkbox"/> *Total of 1 forms are submitted.</p>			

  
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March 29, 2007  
Date

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CENTRAL FAX CENTER****MAR 29 2007**Docket No.: M4065.0957/P957  
(PATENT)**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Joseph F. Brooks et al.

Application No.: 10/725,500

Confirmation No.: 3970

Filed: December 3, 2003

Art Unit: 2818

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For: ELECTRODE STRUCTURES AND METHOD  
TO FORM ELECTRODE STRUCTURES  
THAT MINIMIZE ELECTRODE WORK  
FUNCTION VARIATION

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Examiner: Quoc D. Hoang

**REMARKS ACCOMPANYING PRE-APPEAL BRIEF REQUEST FOR REVIEW**MS Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

Pursuant to the guidelines set forth in the Official Gazette Notice of July 12, 2005 for the Pre-Appeal Brief Conference Program, favorable reconsideration of the subject application is respectfully requested in view of the following remarks.

I. Background of Invention

Electrode structures often employ adhesion and barrier layers between layers of conductive materials. U.S. Pub. No. 2005/0124155, para. 4. Appellants' Figure 1B shows a conventional electrode structure 100 having an adhesion/barrier layer 110 between first and second conductive layers 102, 112. As shown, the arrangement of the adhesion/barrier and second conductive layers 110, 112 causes the upper electrode contact surface to consist of upper surfaces of layers 110, 112, which in turn causes a variation in work function across the contact surface. This variation in work function can have a significant detrimental effect on some devices utilizing such electrode structures 100. For instance, when used in conjunction with an array of programmable resistance memory devices, the work function differences in upper

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electrode contact surfaces of layers 110, 112 can cause a variation in the threshold switching voltage of each device. U.S. Pub. No. 2005/0124155, para. 5.

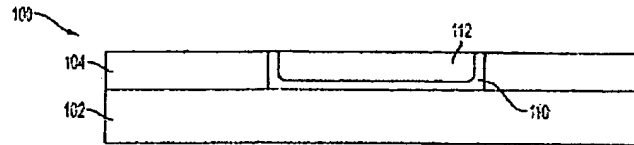


FIG. 1B

## II. Claimed Invention

In order to solve the multiple work function problem, the claimed invention, as recited in claim 21, provides an electrode structure as follows: "An electrode structure, comprising: a first conductive layer; a dielectric layer over said first conductive layer, said dielectric having an opening exposing a portion of said first conductive layer; an adhesion layer in said opening in said dielectric layer and over said exposed portion of said first conductive layer; a second conductive layer formed at least partially over said adhesion layer, wherein said second conductive layer and said adhesion layer are recessed within said opening in said dielectric layer; and a third conductive layer formed over and at least partially in contact with said second conductive layer and said adhesion layer within said opening." The remaining rejected claims depend from independent claim 21.

Non-limiting examples of the claimed invention are provided by Appellants' Figures 5 and 7, shown below. In both examples, the claimed elements correspond to the following illustrated components as follows: first conductive layer (102); dielectric layer (104); adhesion layer (110); second conductive layer (112); and third conductive layer (114), which is over the upper surfaces of 110 and 112. Figure 7 further illustrates a top electrode 210 and memory element 200, which are not recited by claim 21, provided on the third conductive layer (114). The additional (third) conductive layer 114 mitigates problems with having two different materials and associated work functions in contact with memory element 200.

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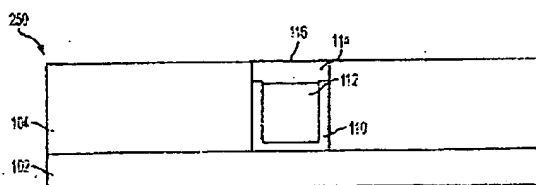


FIG. 5

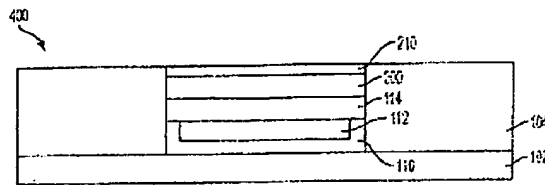


FIG. 7

### III. Office Action

In the outstanding Office Action dated November 29, 2006, claims 21-27 stand rejected under 35 U.S.C. 103(a) as unpatentable over Appellants' Admitted Prior Art (AAPA; Appellants' Figure 2) in view of U.S. Patent No. 6,734,559 to Yang. Claims 28 and 29 stand rejected under 35 U.S.C. 103(a) as unpatentable over AAPA and Yang in view of U.S. Patent No. 5,914,851 to Saenger.<sup>1</sup>

In the rejection of claims 21-27, the Office Action cites AAPA, Appellants' Figure 2, as teaching each feature of claim 21, except for conceding that "AAPA does not teach[] the third conductive layer partially in contact with the second conductive layer and the adhesion layer". Office Action, November 29, 2006, page 3. In addressing this deficiency of AAPA, the Office Action states, "However, Yang teaches a third conductive layer 206 partially in contact with the second conductive layer 201 and the adhesion layer 221 (col. 4, lines 20-34 and Fig. 4)." Office Action, November 29, 2006, page 3. Appellants' Figure 2 and Yang's Figure 4, cited by the Office Action, are provided below.

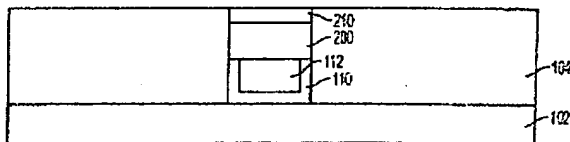


FIG. 2

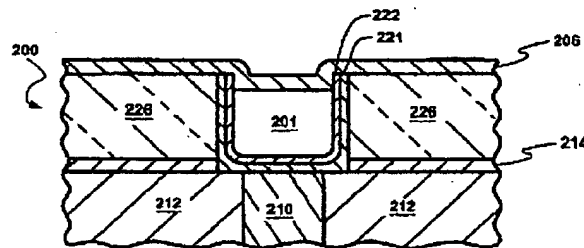


FIG. 4

As motivation to modify AAPA in view of Yang, the Office Action states, "It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form the

<sup>1</sup> The Office Action states that dependent claims 28 and 29 stand rejected under 35 U.S.C. 103(a) as unpatentable over only AAPA in view of Saenger. However, the Examiner clearly intended to reject claims 28 and 29 as

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third conductive layer in contact with the second conductive layer and the adhesion layer in order to obtain the contact plug structure.” Office Action, November 29, 2006, page 3. Appellants note, however, that Figure 4 of Yang is only an intermediate structure, as further processing is applied by Yang to yield the true Yang interconnect shown by Figure 5 reproduced below in which conductor 208 is **not** over adhesion layer 221..

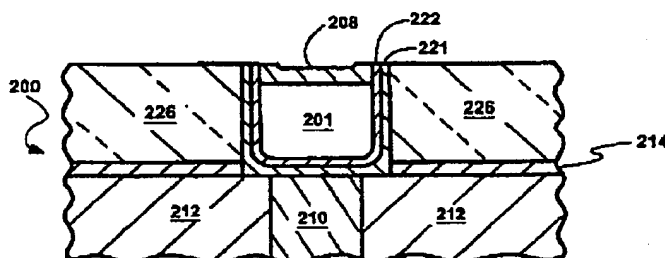


FIG. 5

#### IV. Arguments

Yang does not teach how to modify the AAPA structure to yield the claimed invention. The Office Action's reliance upon Yang's Figure 4, and more particularly upon its illustration of the layer 206 as contacting the adhesion layer 221, is without merit because the **layer 206 of Yang's Figure 4 is not part of the contact plug structure taught by Yang**. Rather, the conductive layer 206 is blanketed over the entire surface of semiconductor wafer 200 as an intermediate step in forming the interconnect barrier 208 of Yang's contact plug, which is **illustrated only by Yang's Figure 5**. Accordingly, any proper teaching with regard to the contact plug structure (as opposed to its fabrication) is directed to the arrangement of components illustrated by Yang's Figure 5. As clearly shown in Yang's Figure 5, layer 206 is polished to form conductor 208 which is **not** over the conductive layer 201 and adhesion layer 221. Even assuming *arguendo* one skilled in the art would be motivated "to obtain the contact plug structure" of Yang, that motivation would only be directed toward obtaining the contact plug structure of Yang's Figure 5, which does not teach the claimed third conductive layer because the conductive layer 208 is not in contact with the adhesion layer 221.

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unpatentable over AAPA and Yang in view of Saenger (which does not relate to the deficiencies of AAPA and Yang discussed herein and therefore is not further addressed).

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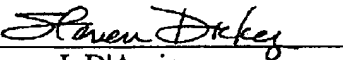
In fact, Yang's Figure 5 teaches away from the layer 208 as being in contact with the adhesion layer 221. More particularly, Yang's Figure 5 teaches that the extending structure of layer 206 is **removed** to seat the layer 206 (now layer 208) within the seed layer 222, which in turn separates the layer 206 from adhesion layer 221. As a result of this separation, the contact plug of Yang's Figure 5 not only fails to teach the claimed third conductive layer, but also teaches away from it and exhibits the same prior art deficiency illustrated by Appellants' Figures 1B and 2, i.e., the presence of multiple work functions at the contact plug surface.

Moreover, if one skilled in the art tried to use Yang's intermediate structure of Figure 4 with the AAPA, there is no suggestion anywhere on how to modify the blanket deposited conductive layer 206 and associated structure to fit within the AAPA via. The only structure disclosed in Yang for the via is in the completed Figure 5 structure which, as noted, teaches directly away from the claimed invention.

Finally, it should also be noted that the Office Action merely states that one skilled in the art would make the proposed modification of AAPA in light of Yang's Figure 4 "to obtain the contact plug structure" of Yang, but does not provide a specific reason as to why one skilled in the art would desire to make the proposed modification. "The mere fact that a prior art device could be modified to produce a claimed invention (not admitted) cannot alone support an obviousness rejection, because there must be some suggestion of a **desirability** to make the modification." MPEP 2143.01.

Dated: March 29, 2007

Respectfully submitted,

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